CSI 2130 Machinery Health Analyzer

- *Data collection, vibration analysis, alignment and balancing in a single unit*
- *Compact, rugged design holds up to any plant environment*
- *Intuitive operation shortens the learning curve for faster implementation*
- *Intelligent design speeds operation to maximize productivity*
- *Embedded intelligence unlocks powerful technology solutions*
- *Modular format offers a clear expansion path to protect your investment*

The Route application in the CSI 2130 uses pre-defined settings to provide instant feedback about machinery health in an easy-to-read color bar graph.

Overview

Maintenance departments today are asked to run with fewer staff and smaller budgets than ever before. In this do-more-with-less environment, maintenance personnel can't afford to continuously chase the next breakdown. They need to quickly and accurately identify developing faults and then get to the root cause of the machinery problem so that it can be fixed once and for all. An effective technology solution must be simple to operate - reducing training requirements - while providing fast actionable information to prioritize maintenance activities. Emerson developed the CSI 2130 Machinery Health Analyzer with these requirements in mind.

The CSI 2130 stands alone as the fastest and most powerful vibration data collector, but its capabilities also include:

- Advanced vibration analysis
- Cross Channel Analysis
- Transient Analysis
- Dynamic balancing
- Laser shaft alignment
- Motor Monitoring

Routine data and corrective maintenance jobs can be uploaded to the companion AMS™ Suite: Machinery Health Manager software for analysis and reporting. Condition alarms can generate alerts in Emerson's PlantWeb® digital architecture, which can be viewed via the AMS Suite: Asset Portal. AMS Asset Portal provides a single, unified view of predictive maintenance and equipment performance on the mechanical equipment, electrical systems, process equipment and intelligent field devices in your facility.

Complex data from vibration signals is condensed into machinery health information and presented in an easy-to-understand bar graph format. Details are available at the push of a button.

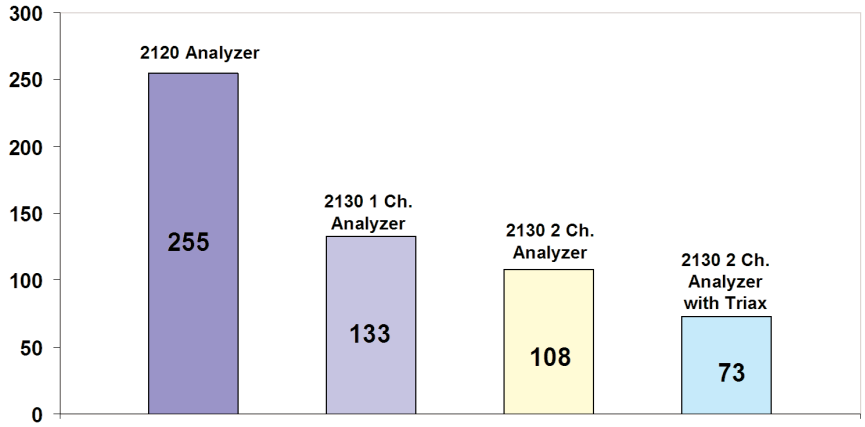
Fastest Route Data Collection

As shown below, data collection time can be reduced by as much as 70% compared to the CSI 2120, and even more when compared to other instruments. Faster data collection translates into more machines being monitored and more time dedicated to the important task of machinery analysis.

Single and Dual Channel

The CSI 2130 is available with either one or two channels of vibration analysis. The two channel version not only enables advanced analysis options— it also brings significant efficiency improvements. Emerson's patented dual channel data collection technique slashes measurement time by an additional 20% to 45%. This increase in productivity frequently justifies the investment within the first year.

Relative Data Collection Time in Seconds



Portable and Durable

The physical attributes of this unit make it ideal for field work in a wide variety of industrial applications. Since its release in January 2003, the CSI 2130 has established itself as the premiere instrument for vibration analysis thanks to an impressive list of capabilities:

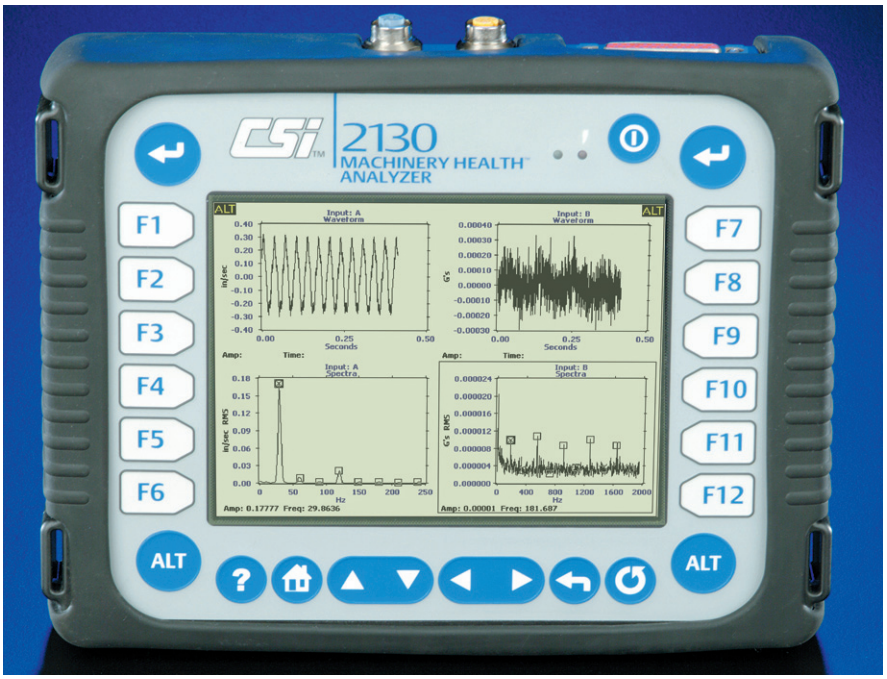
- Large Color Display: backlit VGA display for use anywhere.
- Small and Lightweight: easily carried on long routes
- In-Field Reports: color-coded alarm report for each point.
- Industrial Design: IP-65 rated with optional safety rating.

Easy Operation

The CSI 2130 is designed to be easy to use, so only minimal training is required for effective operation. More than just collecting data, the analyzer converts data into actionable information about machinery health. For example, it can automatically distinguish between imbalance and a bearing fault. The user is instantly notified about the nature of developing faults at the time of measurement, so that he can focus his attention on critical machine issues immediately.

Embedded Intelligence

The ability to perform additional tests at the machine site transforms simple data collection into



The full VGA screen displays standard and PeakVue™ data at the same time. The PeakVue plot (bottom right) provides clear indication of a rolling element bearing fault that is not visible at all in the standard reading (bottom left).

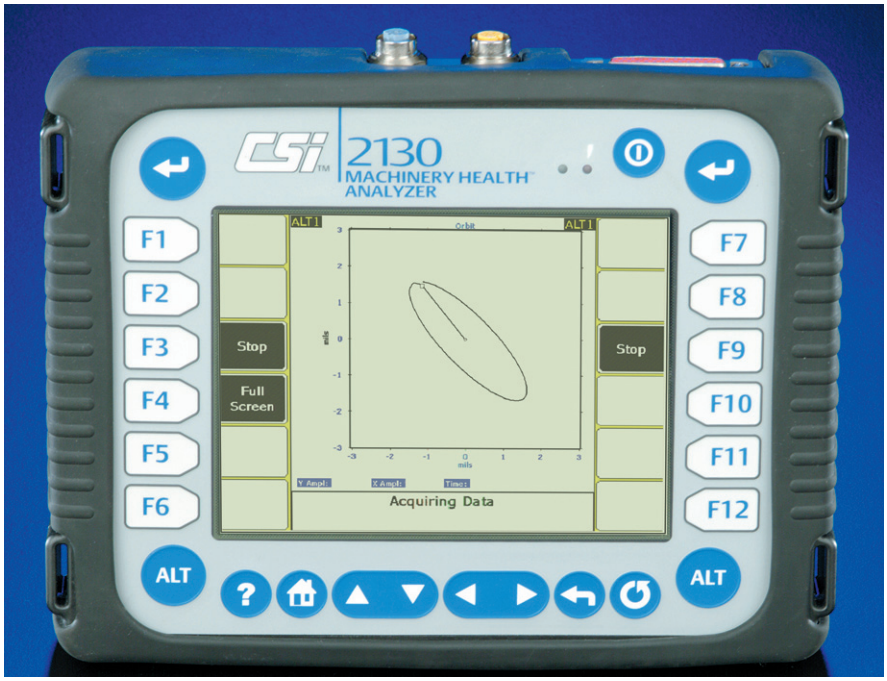
an effective machinery health program. In today's demanding work environment, however, it is difficult to find the time to acquire these skills. That's why Emerson developed and patented the 'Analysis Expert' as an integral part of the CSI 2130. Embedded diagnostics enable even a novice user to conduct sophisticated tests with the touch of a button. The bottom line impact is that users can quickly harness the full power of the CSI 2130 in the field.

Bearing and Gear Analysis

Detecting imbalance or misalignment is easy with any instrument, but the CSI 2130 makes child's play out of detecting developing faults on bearings and gears as well. Emerson's patented PeakVue® processing applies digital technology to detect stress waves - the earliest sign of bearing and gear wear. In comparison, demodulation and other analog technologies typically can not detect such faults until much later – and sometimes not at all.

PeakVue processing not only offers the earliest warning of developing faults; it also provides an indication of severity. Measurements can be reliably trended to determine the optimal timing for maintenance.

With PeakVue, machinery faults are clearly visible in the waveform, opening up important new options for fault detection and diagnosis.



Filtered orbits can be displayed and transferred back to the software. Orbits provide information about the health of sleeve bearing machines.

Full Spectrum of Measurement

Another unique feature of the CSI 2130 is its exceptional frequency range. Using Emerson's patented Slow Speed Technology (SST), the analyzer can accurately measure signals on critical low speed equipment that would be out of range for other vibration analyzers. On the other end of the spectrum, the CSI 2130 also boasts the highest frequency range available. It can measure signals up to 80,000 Hz, which is important for accurate diagnosis of centrifugal compressors and other high speed machinery.

Variable Speed Analysis

Variable speed analysis is essential to any effective machinery health program because most critical pieces of equipment must be operated at varying speeds to accommodate the changing production demands. While most vibration systems do not take variable speed into account during data collection, the CSI 2130 automatically adapts all of its diagnostic tools to variable turning speeds during routine data collection. This provides an accurate evaluation of developing problems in the field.

Add Prediction to Online Monitoring

Many online monitoring systems installed in plants today serve as nothing more than a shutdown switch in case a catastrophic condition develops. By feeding the signals from these systems into the CSI 2130, it is possible to add predictive capabilities by identifying faults before a catastrophe occurs. Orbit plots can be generated to identify problems such as misalignment and shaft rubs. Trending data also provides valuable insight into developing cracks and other types of structural faults.

Monitoring Trouble Spots

The CSI 2130 also serves as a temporary on-line monitor. It can automatically acquire and store data such as the overall vibration, fault frequencies associated with specific fault types, or even the complete spectrum over an extended period of time. With line power, it is possible to monitor machine health for longer spans up to a month (e.g. to capture the break-in period for new equipment or to ensure that a machine with a known fault can make it to the next outage).

Capture Machine Shutdowns

For analysis of transient events, the CSI 2130 is able to collect a series of 'snapshots' of machine vibration during start-up, coast-down or process changes. These spectra can then be viewed individually or in a Cascade plot.

Correlate Vibration and Process Variables

Use the dual channel feature of the CSI 2130 to correlate machinery vibration with process variables. This is accomplished by inputting the process information as a volt signal into one channel, while monitoring vibration on the other.

Unsurpassed Versatility

The CSI 2130 incorporates a modular design so that it can be configured to specifically address your current situation. As your needs evolve, it can be easily and affordably expanded to enhance your capabilities while protecting your initial investment. This versatile unit can be purchased as a single- or dual channel analyzer – with or without route measurement capability, as a dedicated field balancer, or as a laser alignment calculator. Put together any combination of capabilities to match your requirements. Additional modules are also available for transient and structural analysis.

The Cascade application captures machine vibration during start-up, coast-down, or over an extended period of time. Top half of screen shows spectra individually; bottom half of screen shows cascade plot.

Advanced Cross-Channel Analysis

Standard data collection serves as an excellent base for identifying developing machinery faults, but often times cross-channel analysis is required to identify the root cause of the fault. Expand the vibration analysis application with the cross channel module to determine the actual movement of the shaft during operation and to identify structural faults such as cracks and resonances. While the dual-channel CSI 2130 comes standard with the ability to display orbits for turbo machinery analysis, the optional Advanced Cross-Channel application expands these capabilities to include impact testing and other types of cross-channel analysis. As a further enhancement, the ODS/Modal application (Operational Deflection Shapes) makes short work out of structural analysis by automatically configuring the required series of cross-channel tests.

Cross-channel data can also be analyzed in the VibPro module of the AMS Machinery Manager application, or exported to specialized ODS/Modal analysis software.

The Advanced Transient application records the vibration signature from machine start-up, coast-down or during process disruptions for advanced analysis.

Transient Analysis

The Advanced Transient Analysis application expands the power of any single or dual channel analyzer to record the raw vibration signal over a prolonged period of time for post-processing and analysis. This is essential for diagnostics of turbomachinery, start-up and coast-down, or machines with short, repetitive duty cycles. This data can be examined directly on the CSI 2130 Analyzer or with the VibPro module in AMS Machinery Manager.

Field Balancing

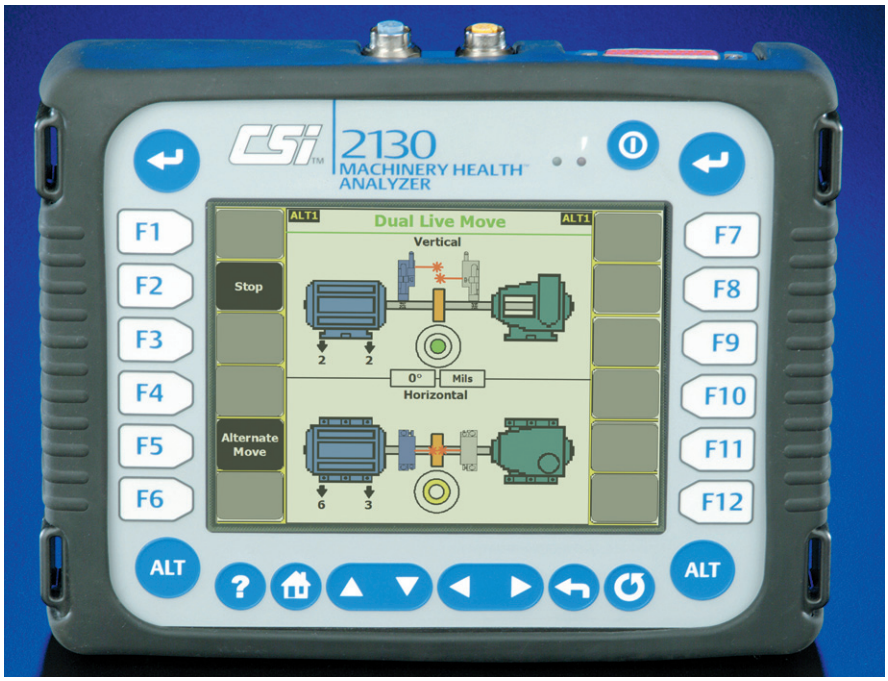
The Advanced Balancing application transforms the CSI 2130 into a powerful field balancer. This application combines advanced technology with simple, straightforward operation for a fast, effective solution to your balancing problems. The graphical user interface automatically guides the user through the balance checklist so that only minimal training is required for effective operation.

The program offers a basic mode for simple one- or two-plane balancing, and an advanced mode for more complex jobs. Full job documentation can be sent directly to a printer or stored on a PC using the UltraMgr module of AMS Machinery Manager.

The Advanced Balancing application offers two new solutions to the challenge of field balancing:

Vector Averaging - This technique systematically removes background vibration that would otherwise contaminate the calculated solution.

Balancing Watchdog - this patented technology automatically checks the vibration data on the machine while the user performs the balance job. The Watchdog is able to identify and alert the user to severe structural faults (such as looseness or resonance) that would otherwise make the job difficult or impossible to complete. The user can take corrective action to remove the structural fault, balance the rotor, and leave the machine in reliable operating condition.



Applications for Advanced Balancing and Alignment make it possible to detect and correct machinery faults with the same unit.

Laser Alignment

The Advanced Laser Alignment application offers a graphically-driven user interface and wireless operation to quickly and easily complete alignment jobs. Emerson's advanced laser system uses built-in dual inclinometers to automatically determine the shaft position, so the user simply rotates the shaft and the solution is plotted on the screen. The live move option then updates the change in alignment condition during the machine move. Full job documentation is available using the UltraMgr module in AMS Machinery Manager.

The Laser Alignment Expansion Pak adds this important capability to any CSI 2130 analyzer.

Motor Current Analysis

Together with the MotorView module in AMS Machinery Manager, the CSI 2130 performs non-intrusive analysis of the rotor and stator condition in induction motors. This can be accomplished with a standard current clamp or Emerson's patented flux monitoring.

Industrial Ratings

Designed for use in industrial environments, the CSI 2130 has received an IP 65 rating certifying that it is dust- and splashwater tight. It is also certified to comply with international safety standards in the United States, Canada and Europe for hazardous areas.

Accessory Options

Speed Detection

Accurate detection of the shaft turning speed is critical to effective machinery health analysis. The CSI 430 Laser Speed Sensor provides the industry-leading method to determine shaft speed without requiring reflective tape or any specific markings on the machine.

Triaxial Accelerometer

The Model A0643TX is a revolutionary new triaxial sensor. Using Emerson's patented design, this sensor can be magnet mounted and still provide high quality readings in all three directions.

Proximity Probe Connections

To measure orbits on a protection system, use BNC-type cables and the dual volt adapter. The phase reference can be input using the generic tach cable.

Structural Analysis

For advanced structural analysis, use a modally-tuned hammer.

See pages 10 -12 for additional accessory listings.

General Specifications

Physical Data

Color Display
- 5.75" x 4.25" (146 mm x 108 mm) Transflective (for indoor or outdoor use) liquid crystal display, built-in backlight, 640 x 480 pixel

Key Pad
- Oversized, easy to press keys, 12 soft function keys, context sensitive help key

Height
- 8" (203 mm)

Depth
- 1.88" (48 mm)

Width
- 10.25" (260 mm)

Weight
- 4.5 lbs (2.04 kg)

Operating Conditions

Moisture
- Sealed enclosure, IP-65 rated

Temperature
- 15 to 113 ºF (-10 to 45 C)

Power Supply

Battery
- NiMH

Capacity
- 4.5 amp hours

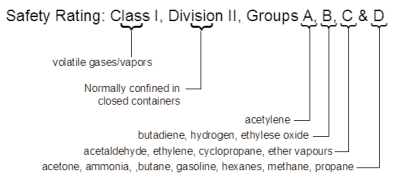
Voltage
- 7.2 V

Battery Life
- Over 8 hours typical use (longer with backlight off). Data saved in the event of low battery voltage.

Charger
- Discharge/Fastcharge/Trickle charge "Smart Charger". Also functions as a continuous power supply.

Recharge Time
- 3 hours

Quality Assurance
- NIST Traceable calibration. Safety rated versions available, approved to Class I, Division II rating for Groups A,B,C, & D. Performance specifications for safety rated version are identical to standard model.


Safety Rating: Class I, Division II, Groups A, B, C & D
volatile gases/vapors
Normally confined in closed containers
acetylene
butadiene, hydrogen, ethylese oxide
acetaldehyde, ethylene, cyclopropane, ether vapours
acetone, ammonia, ,butane, gasoline, hexanes, methane, propane

NOTE: Partial listing of gases is meant as a guideline only. Refer to applicable safety code to classify a specific site.

Analyze & Route Specifications

Analysis Experts

Interactive data acquisition setups for the following analysis types:

High Frequency, High Resolution, Bearing/Gear Fault analysis, Low Frequency, Order Tracking, Synchronous Time Averaging, Bump Test (on and off-line), Coastdown (peak-hold and peak/phase), Turning Speed Detection (vibration and laser), Rotor Fault Detection, Cross Channel Phase*, and Orbit Analysis*.

Data Analysis Speed:

400 line / 1000 Hz spectrum
- 0.14 sec/avg

1600 line / 1000 Hz spectrum
- 0.5 sec/avg

Analysis Capabilities:

Noise Floor
- Less than 0.2 micro-volts per root Hz over 1,000 Hz frequency range.

PeakVue
- Built in, with selectable filters

Demodulation
- Built in, with selectable filters

SST
- Built in Low Frequency processing

Dual-Channel*
- Fully matched, independently configurable. Simultaneous dual channel collection. Filtered Orbit analysis.

Cross-Channel*
- Synchronized cross channel Phase and Coherence (Full Spectrum or Single Frequency)

Dynamic Analysis
- Overall, Spectra, Waveform, 12 analysis parameters, 1/3 Octave, A-weighting, Phase, Bode/Nyquist

Signal Range:
- Autoranging maintains optimum dynamic range. 16 bit A/D Converter has 96 dB Dynamic Range, (coupled with analog integration provides better than 120 dB for typical applications).

Frequency Range
- 740 ranges from DC-10 Hz to DC-80 kHz.

Low Frequency Response
- DC coupling on non-powered inputs allows flat response to DC for non-integrated signals.

Resolution
- 1/3 Octave, 100, 200, 400, 800, 1600, 3200, 6,400, 12,800 lines. True Zoom provides effective resolution of up to 300,000 lines.

Averaging
- Normal, Exponential, Peak Hold, Order Tracking, Synchronous Time, and Negative Averaging

Number of Averages
- 5,000 in route mode, 10,000 in Job mode, unlimited in Monitor mode

Integration
- None, Single, Double (Analog or Digital)

Trigger
- Vibration level, Pretrigger, Tach, Pretach

Anti-Aliasing
- Filters attenuate all alias components to below noise floor.

Amplitude Units
- Metric or English, acceleration, velocity, displacement, or user programmable

Frequency Units
- Hz, CPM, Orders

Scaling
- Linear or Log, both X and Y axes

Windows
- Hanning or Uniform

Cursor
- Single, Harmonic, Moving Harmonic, Sideband

Memory
- 80 MB total. 32 MB for programs and data storage (expandable with off- the-shelf Flash RAM cards). 16 MB for operating system.

Signal Input

Powered Inputs
- (2 mA, +20 V ICP power supply) +/- 15 V

Non-Powered Inputs
- +/- 24 V range

Input Impedance
- greater than 125 k ohms

Tach
- TTL input, built in conditioning for non TTL signals, adjustable trigger

Pseudo tach
- Generates tach pulses for hidden shafts

Triaxial
- Internal multiplexer for automatic sequencing of triaxial measurements

Output
- Communication with Host Computer with USB, Ethernet, Serial, or E-mailable data files

*applies to dual channel models

Balancing Specifications

Basic Mode offers:

- Pre-configured jobs for single and two plane balancing
- Full calculator mode

Advanced Mode adds:

- Up to 4 planes
- Up to 8 sensor inputs
- Up to 6 different speeds
- Automatic unit conversion
- Automatic weight splitting
- Trial weight estimation

Special Features:

Vector Averaging
- Eliminates background vibration

Balancing Watchdog
- Automatically detects secondary machinery faults

Graphic User Interface
- Provides data stability indicator
- Displays live imbalance vector
- Eliminates confusion about weight placement

Alignment Specifications

Basic Mode offers:

- Auto sweep (includes partial sweep)
- Manual 4 point
- Soft foot detection
- Thermal growth compensation
- Live machine moves
- Jackshaft applications
- Record notes and observations
- Store and recall jobs

Advanced Mode adds:

- QuickSpec alignment checker
- Manual sweep
- Dual pass mode (uncoupled shafts)
- Vertical machine alignment
- C-face alignment
- Straightness measurement
- Enhanced soft foot detection
- Data averaging
- Custom machine configuration
- Custom tolerance values
- Additional live move options
- Upload jobs to software

CSI Laser Heads

Communication:

- Standard via cables
- Cableless measurement
- Optional RF (where permitted)

Special Features:

- Dual built-in inclinometers
- Dual axis position sensors
- On-board signal processing
- Better than 1 µ precision

Part No.	Description	Applications					Vib.		S/W	Ratings		
		Route	Analyze	Cascade	Balance	Basic Align	Adv. Align	1 Channel	2 Channel	UltraMgr	FM	CSA	ATEX
A2130A1	Std. 1 ch. Route/Analyze/Cascade	•	•	•				•					
A21301Q	Safety-rated 1 ch. Route/Analyze/Cascade	•	•	•				•			•	•	•
A2130A2	Std. 2 ch. Route/Analyze/Cascade	•	•	•					•				
A21302Q	Safety-rated 2 ch. Route/Analyze/Cascade	•	•	•					•		•	•	•
A8130Z1	1 ch. Vibration Analyzer Package		•					•					
A8130Z2	2 ch. Vibration Analyzer Package		•						•				
A8130B1	1 ch. Adv. Balance Analyzer Package				•			•		•			
A8130EZ-IN	Basic Laser Align Pkg / 8215 cabled heads					•							
A8130EZ	Basic Laser Align Pkg / 8215 RF heads					•							
A813015-IN	Adv. Laser Align Pkg / 8215 cabled heads						•			•			
A813015-CU	Adv. Laser Align Pkg / 8215 RF heads						•			•			
A813025-IN	Adv. Laser Align Pkg / 8225 cabled heads						•			•			
A813025-CU	Adv. Laser Align Pkg / 8225 RF heads						•			•			

Part Number	Description
CSI 2130 Packages:	
A2130A1	1-channel CSI 2130 with std accessories
A21301Q	1-channel safety-rated CSI 2130 with std accessories
A2130A2	2-channel CSI 2130 with std accessories
A21302Q	2-channel safety-rated CSI 2130 with std accessories
A8130Z1	1-channel vibration only with std. accessories
A8130Z2	2-channel vibration only with std. accessories
A8130B1	1-channel balance only with std. balance accessories
A8130EZ-IN	Basic Laser Align Package with 8215 cabled heads
A8130EZ	Basic Laser Align Package with 8215 RF heads
A813015-IN	Advanced Laser Align Package with 8215 cabled heads
A813015-CU	Advanced Laser Align Package with 8215 RF heads
A813025-IN	Advanced Laser Align Package with 8225 cabled heads
A813025-CU	Advanced Laser Align Package with 8225 RF heads
Firmware Applications:	
A2130S0	Route/Analyze/Cascade applications
A2130S2	Analyze application
A2130S3	Advanced Analyze application
A2130S4	Advanced Transient application
A2130S5	ODS/Modal application
A2130S7	Advanced Balancing application
A2130S8	Basic Laser Alignment application
A2130S9	Advanced Laser Alignment application
Standard Accessories:	
D24642	2130 Protective rubber jacket
A063902	USB communications cable
D24899	2130 hand strap - qty 2
D24834	2130 hand pad - qty 2
D24933	Shoulder strap for vibration meters
D24892	Hardshell carrying case
93140	Power Supply
65010	Power Cord
91413	Screen protector starter pack - Reorder using P/N 91411
Vibration Measurement Accessories:	
A0760GP	Accelerometer
A090835	Magnet
A6121BL	Cable, 2-pin MIL to BNC, blue, 4'
A6121RD	Cable, 2-pin MIL to BNC, red, 4'
D24844	Coiled accelerometer cable, 2-pin to Turck, 8' extended
A06280A	Dual-channel accel adapter, 25-pin to 2 BNC
Balancing Accessory Package:	
A648	4-channel multiplexer
A0404P1	1 - 20K RPM Infrared Phototach Kit, including: ■ A040801 - Phototach power supply ■ A403 - Reflective tape (3 rolls) ■ 24862 - Phototach cable
D24786	Hard shell suitcase

Standard Laser Accessories include:

D23465	Mounting posts (4)
A8211	Super fast smart charging station
A8AA10	Tape Measure
A821510	Direct connect cable
99451	Screwdriver
D24492	Hard shell suitcase
A8AA55	Quick mount brackets & chains (2) - Basic Package only
B821007	Standard mount brackets (2) - Adv. Package only
B8210-CHN	Standard mount chains (2) - Adv. Package only
99510	Hex ball driver- Adv. packages only
B8100-EXT2	Extension Blocks (2) - Adv. packages only
A8215C2-PM	Pass Mode Cable - RF packages only
B8000RF	RF adapter - RF packages only

CSI 430 Laser Speed Sensor

Expansion Paks:

A1730B1	Balance Expansion Pak for 2130
A8730EZ-IN	Basic Laser Expansion Pak - 10x10 mm cabled heads
A8730EZ	Basic Laser Expansion Pak - 10x10 mm RF heads
A873015-IN	Adv. Laser Expansion Pak - 10x10 mm cabled heads
A873015-CU	Adv. Laser Expansion Pak - 10x10 mm RF heads
A873025-IN	Adv. Laser Expansion Pak - 20x20 mm cabled heads
A873025-CU	Adv. Laser Expansion Pak - 20x20 mm RF heads

Phototachs, Strobes, and Speed Sensors

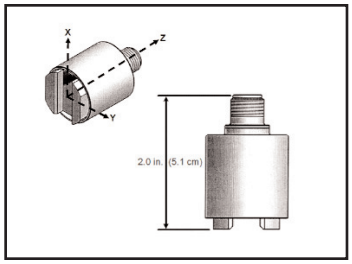
A0430L3	SpeedVue laser speed sensor package for 2130
A0404B1	404B IR Phototach for 2130
A0404P1	404B IR Phototach for 2130 with external power
A444003	Computerized strobe light package for 2130

Special Vibration Sensors

A0120LF	Low frequency accel, top connect, 2 pin
A0220HF	High frequency accel, top connect, 2 pin
A0222H1	60 kHz high freq. accel, top connect, stud mount
A0222H2	60 kHz high freq. accel, top connect, epoxy mount
A0623SS	SST kit for low frequency measurements

Triaxial Accelerometer

A0643TX	Triax accelerometer for CSI 2130
D24826	Mounting pad for A0643TX
D25064	Cable for A0643TX



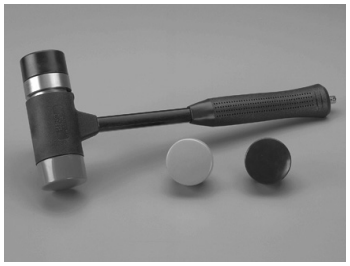
Emerson's patented triaxial sensor with integral magnet

Modally-tuned Impact Hammer

A034701	1 lb Small Modal Force Hammer
A034703	3 lb Mini-Sledge Modal Force Hammer
A034712	12 lb Sledge Modal Force Hammer

Adapters

A06290V	Dual-channel volt adapter, 25-pin to 2 BNC
A06280A	Dual-channel accel adapter (Turck connectors)
A648	4-channel accelerometer input multiplexer for 2130



Modal Hammer

Current Clamps

A341B	Clip-on AC current clamp (1.0 to 600 Amp AC)
A341C	Clip-on AC current clamp (50 mA to 150 Amp AC)
A341D	Clip-on AC current clamp (0.05 mA to 1000 Amp AC)

Current Clamps

Cables

D24859	2130 Volts straight cable, BNC to Turck, 4' long
D24861	2130 tach cable, 404B connector to blue Turck, 2 m
D24862	2130 tach cable, BNC to blue Turck, 4'
D24863-1	2130 SpeedVue cable, LEMO to Turck, 18" long
D24863-2	2130 SpeedVue cable, LEMO to Turck, 6 ft. long
D24973	2130 accel/hammer straight cable, BNC to Turck, 6.5' (2m)
D24809-2	SpeedVue cable for 2120A (6 ft. long)
65116	Ext. cable for Turck Accel connector, 6' 5"
65117	Ext. cable for Turck Accel connector, 19' 8"
65118	Ext. cable for Turck tach connector, 6' 5"
65119	Ext. cable for Turck tach connector, 19' 8"

Battery Pack

D24777	Battery Pack for A2130A2
D24974	Battery Pack for A21302Q

Other accessories

A0130FS	Folding Desk Stand for CSI 2130
91411	2130 Adhesive Screen Protectors (10 pack)
D24937	SpeedVue mounting strap for 2130
97017	2130 Printed User Manual

Note: Descriptions are for illustrative purposes only. Packages and part numbers subject to change without notice.

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